Breakout session II (Cloud-aerosol interactions) Report

- **What is the present status of predicting CCN spectrum from aerosol size distribution and chemical composition ?**

  - Calculated CCN spectrum is sensitive to aerosol size distribution and mixing state.

  - The CCN spectrum also depends on the hygroscopicity of organics when the organics volume fraction is high.

  - Need to study the CCN properties of organic aerosols (both through laboratory and field studies)

  - The chemical aging of organics is not an efficient pathway for converting to CCN compared to the condensation of hydrophilic species.

    BC/Aerodyne, B. Ervens, J. Wang, Y.N. Lee, S. Martin

The effects of aerosol on warm clouds

- Effects of aerosol on drizzle formation, which impact entrainment and liquid water content.

  - VOCALS will be carried out in Oct –Nov 2008 near coast of Chile. Extensive cloud coverage and large gradient in aerosol concentration are expected. One of the focuses will be the aerosol effect on drizzle formation and test of developed autoconversion parameterization (ASP VOCALS team)

  - The study requires high time resolution measurements of cloud microphysics (G. Senum and S. Springston)

  - The effect will also be studied through LES simulation in combination of field data (H. Guo, Y.G. Liu, J. Seinfeld)

The effects of aerosol on warm clouds

- **Twomey effect**
  - The influence of aerosol on cloud droplet size has been observed in many previous studies

  - In addition to aerosol, the evaluation of Twomey effect also depends on the updraft velocity and entrainment mixing, which impact the abiabaticity of clouds.

  - Previous aerosol-droplet number closure studies have mainly focused on adiabatic cloud parcels.

  - Effects of entrainment mixing, updraft velocity, and dispersion on evaluation of Twomey effect will be one of the focuses of ASP.

Ice cloud and mixed phase cloud

- The influence of aerosol particles on the IN properties is poorly understood. There are a variety of ice crystal nucleation modes.

  - Current ASP projects including laboratory studies of the ice nucleating properties of aerosols (P. Ziemann, S. Kreidenweis, D. Cziczo)

  - The particle IN properties will also be studied in ISDAC (ISDAC team).

  - Development of parameterization of IN for global models (In coordination with ARM projects , S. Ghan X.H. Liu)

Effects of cloud on aerosol properties

- The formation of organics in cloud droplets can potentially be an important source

    - The importance of this source will be investigated using CHAPS data and global model (B. Ervens and CHAPS team)

- The processing of aerosol by clouds (e.g. particle transport, collision/coalescence, and in- and below-cloud scavenging) is crudely represented in regional and global models.

    - This will be studied using CHAPS data and LES/2-D particle size distribution model (M. Ovtchinnikov and CHAPS team)

Coordination among ASP projects and with other programs

- Good coordination among ASP projects and with other programs.
    - Collaboration between modelers and experimentalists
    - Joint field deployments with other program/agencies (ARM, NSF, NASA during MASE, CHAPS, ISDAC, VOCALS)
    - Coordination with ARM projects

- Recommendations:
    - More coordination with CCPP program. Develop parameterizations for global models based on the results of ASP studies. (S. Ghan)